

SECTION 3  
REINFORCING STEEL

3-1 GENERAL SPECIFICATION REVIEW FOR DECK REINFORCING

Section 52-1.02A of the Standard Specifications require that all reinforcing for bridges conform to the specifications of ASTM Designation: A 615, Grade 60 or low alloy steel deformed bars conforming to ASTM Designation: A 706. Welded wire fabric may be used in lieu of uncoated reinforcing for overlays only.

If the plans show that the deck reinforcing is epoxy coated, then all the requirements of Section 5201.02A must be met plus the epoxy coating must meet the requirements of Section 5201.02B of the Standard Specifications.

3-1.1 STANDARD DETAILS

These items will be included in the Standard Plans. Check page B0-5 for transverse and longitudinal reinforcing spacing requirements, location of deck construction joints and deck reinforcing placement notes. If there are Access Openings in the deck, check page B7-11 for reinforcing details. For placement of deck drains and barrier rail reinforcing details, see pages B11-53 and B11-54.

Other information such as hook and bend length and radius are in the CONSTRUCTION RECORDS AND PROCEDURES MANUAL, VOLUME 2, CHAPTER 165. The information conforms to the requirements of the ACI code for hooks and bends.

### 3-1.2 DETAILING AND FABRICATION

In order to reduce the probability of errors due to detailing, the deck contours (4-scales) should be made available to the prime contractor for the reinforcing steel fabricator's use. Special details of the deck reinforcing and any change orders affecting reinforcement should be brought to the contractor's attention.

Errors in detailing or fabrication are more likely to occur on bridges with the following characteristics:

- \* varying girder spacing
- \* varying deck thickness
- \* large skew
- \* varying skew
- \* wide curved bridges with small radius of curvature
- \* widenings and future widenings

Typical errors to watch out for on these bridges include incorrect reinforcing in the corners, truss bars not centered over the girders, incorrect termination location (endo), omission of bars at the overhangs at the bent cap, etc. Also omission of reinforcing shown on the Standard Details, especially around barrier rail mounted utilities is not uncommon.

Fabrication is seldom a problem unless the standard industry practices for fabrication tolerances are ignored.

## 3-2 INSPECTION

### 3-2.1 PLACEMENT

Reinforcing must be placed as shown on the contract plans, the Standard Plans, or any applicable change orders. Accurate reinforcing steel placement is very important. Included in the Appendix is a memo with calculations showing that the moment carrying capacity of a bridge deck varies greatly when the effective depth of the section is only slightly changed.

Correct placement is covered in Section 52-1.07 of the Standard Specifications. For specific problems in placement not covered in the Standard Specifications, check with the designer to determine the tolerances or variations in placement that are allowable.

During field inspection of the reinforcing, check the markings on the bars. The markings identify the bar size, grade and steel mill. A complete guide to reading the markings on the bars is in Appendix 3 of this manual and in Chapter 165 of the Construction Records and Procedures manual.

Periodic and timely inspections are strongly recommended during bar placement in order to detect and correct errors early.

### 3-2.2 CLEARANCES

Correctly placed deck reinforcing that provides the planned clearance or cover for the bars is extremely important. Too little cover, especially in a corrosive environment, will not adequately

protect reinforcing from rusting and can dramatically shorten the life of the deck. Spalling of deck concrete, barrier rail or edge of deck concrete caused by corroding reinforcing with inadequate cover creates unsightly stains and costly maintenance problems. Be sure and check that the minimum clearance to the top deck, the boundaries and the end is 2 inches. In marine environments or in areas where de-icing chemicals are used, the planned cover will probably be greater than the minimum 2 inches. The required minimum clearance will be shown on the plans.

### 3-2.3 SPLICES

Lap splicing, the most common method of splicing deck bars, is covered in section 52-1.08A of the Standard Specifications. For the most common sizes of Grade 60 deck reinforcing, the minimum lap splice length is 45 bar diameters. Unless shown otherwise shown on the plans, the splices in adjacent bars shall be staggered. The minimum distance between the staggered splices shall be 45 diameters or one splice length. The American Concrete Institute will permit shorter distance between staggered splices depending upon the level of stress in the bars. If the contractor's bar splicing plan shows the deck bar splices staggered at less than the minimum distance, check with the designer to verify the proposed spacing. During your inspection, make sure the splices are securely tied and will not move during the deck pour. For widenings and closure pours, check the plans carefully for the type of splice required. Refer to Section 52-1.08 B thru E of the

Standard Specifications and Bridge Construction Memo 165-7.0 located in the Bridge Construction Records and Procedures for the correct procedures to follow for welded or mechanically spliced reinforcing.

#### 3-2.4 BLOCKING AND TYING

All deck reinforcing must be securely tied and blocked up off the lost deck forms to prevent any movement during placement of the deck concrete. The Standard Specifications do not permit the use of wooden, plastic or aluminum supports. If ferrous metal chairs are used, they must also have at least 1" of clearance. The plastic coatings on the chair feet are not considered to be effective and are not counted to be part of the 1" clearance. The Specifications also do not permit placing reinforcing into wet concrete during the pour.

Between the girders, "ducked" or buried bars are shown on the plans to support the bottom mat. They are #4 bars spaced at about 2 ft on center. Truss bars and concrete blocks support the top mat. Truss bars must be securely tied to prevent any rotation. If they rotate, the top mat will be out of position and a reduction in deck strength will be the result. If truss bars are not used, the contractor will use concrete spacer blocks to support the top mat. At or near the girders, some contractors will attempt to support the top deck mat on the stirrup tails. This can be an ineffective method of support provided that the tails are correctly positioned to do this task and the bars are securely tied to the tails to

prevent movement before or during the pour.

In general, mats of reinforcing steel must be tied so that individual bars cannot move during the pour. The American Concrete Institute recommends that bars be tied at every other intersection. This is adequate in most cases. At corners, over bent caps and other special locations, more frequent tying may be necessary. See Section 52-1.07 of the Standard Specifications for tying and other placement requirements.